Cunningham
RADIO TUBES

C-338

POWER AMPLIFIER PENTODE

The '38 is a power amplifier pentode for use in the output stage of automobile receivers and in sets operated from d-c power lines. It is capable of giving a large power output for a relatively small input signal voltage. The '38 contains a heater-cathode which is designed for d-c operation. Its design permits uniform tube operation over a comparatively wide range of heater voltages without appreciably affecting either performance or serviceability of the tube. This feature, together with that of the general freedom from microphonic and battery circuit disturbances makes the '38 well suited to mobile service and other applications where complete d-c operation is desirable.

CHARACTERISTICS

HEATER VOLTAGE (D. C.)		6.3	Volts
HEATER CURRENT		0.3	Ampere
PLATE VOLTAGE	100	135 *max.*	Volts
SCREEN VOLTAGE	100	135 *max.*	Volts
GRID VOLTAGE*	−9	−13.5	Volts
PLATE CURRENT	7	9	Milliamperes
SCREEN CURRENT	2	2.5	Milliamperes
PLATE RESISTANCE (Approx.)	84000	102000	Ohms
AMPLIFICATION FACTOR (Approx.)	80	100	
MUTUAL CONDUCTANCE	950	975	Micromhos
LOAD RESISTANCE	8500	13500	Ohms
POWER OUTPUT	200	525	Milliwatts
EFFECTIVE GRID-PLATE CAPACITANCE.		0.3	μμf.
INPUT CAPACITANCE		4.1	μμf.
OUTPUT CAPACITANCE		8.5	μμf.
OVERALL LENGTH			4 9/32" to 4 17/32"
MAXIMUM DIAMETER			1 9/16"
BULB (See page 42, Fig. 9)			S-12
CAP			Small Metal
BASE			Small 5-Pin

* If the '38 is self-biased, the biasing resistor should be by-passed by a large condenser. With self-bias, the resistance of the grid circuit coupling should not exceed 1.0 megohm; without self-bias, the grid resistance should not exceed 0.5 megohm.

INSTALLATION

The **base** pins of the '38 fit the standard five-contact socket. The socket may be installed to hold the tube in any position. For socket connections, see page 39, Fig. 9.

For **heater** operation, refer to INSTALLATION for type '37.

The **cathode** circuit in most d-c receivers is usually tied in either directly or through biasing resistors to the negative side of the heater circuit. The potential difference thus introduced between heater and cathode should be kept as much as possible below the recommended maximum of 45 volts.

APPLICATION

For the **power amplifier** stage of radio receivers, the '38 is recommended either singly or in push-pull combination. More than one audio stage preceding the '38 is undesirable because of the possibility of microphonic disturbances resulting from the high level of amplification.

If a single '38 is operated self-biased, the self-biasing resistor for 135 volts on the plate should be approximately 1200 ohms. This resistor should be shunted by a condenser of 4 to 20 μf. to avoid degeneration effects at low audio frequencies. The use of two '38's in push-pull eliminates the necessity of by-passing the resistor. The self-biasing resistor required for the push-pull stage is approximately 600 ohms.

Any conventional type of **input coupling** may be used provided that the resistance added to the grid circuit by this device is not too high. Transformer or impedance coupling devices are preferable where the '38 follows a '37 detector. If a screen grid detector is used, however, resistance coupling or a combination of impedance-resistance coupling to the '38 will be better. A coupling condenser of 0.005 μf. will be suitable in such circuits.

An **output transformer** should be used to supply power to the winding of the reproducing unit. The optimum value of load resistance for the output device is 13500 ohms for a plate voltage of 135 volts and 8500 ohms for a plate voltage of 100 volts. For best results, the impedance in the plate circuit of the '38 over the entire audio-frequency range should be as uniform as possible.